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Westinghouse

ELECTRIC CORPORATION

AIR ARM BUILDING

DPS-6585
COPY 1 OF 1

PHONE: SOUTHFIELD 1-1000
FRIENDSHIP INT'L AIRPORT
BOX 746, BALTIMORE 3, MD.

23 December 1958

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SUBJECT: Contract TA-3034
Interim Invention Report

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Dear

Under the provisions of the Patent Rights Article of the subject contract, Contractor hereby reports disclosure
STAT 38,132 by as a Subject Invention.

A copy of the disclosure is attached. It is not the intention of Contractor to file a patent application on this disclosure.

Very truly yours,

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Sales Engineer

Declassified in Part - Sanitized Copy Approved for Release 2011/12/06 : CIA-RDP89B00709R000400890005-3

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PATENT DISCLOSURE TRANSMITTAL SHEET

38132

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TO: [redacted] - Plant 1 WORKS, PATENT DEPARTMENT
(PITTSBURGH, SO. PHILA., OR BLOOMFIELD)

DISCLOSURE TITLE		
RAPID SCAN ANTENNA		
DISCLOSURE BOOK NO.	PAGE NO.	TRANSMITTAL DATE
5221	8	
WORKS FROM: Baltimore	DIVISION Air Arm	DEPARTMENT Surveillance Radar

INVENTOR PLEASE NOTE: You should send this sheet and your disclosure direct to the Patent Department. Please give all information requested.

1. Was this invention made, or first used, in the performance of a Government contract? Yes If so, give following information on first such contract: GOVERNMENT CONTRACT NO. TA 3034 WESTINGHOUSE GEN. ORD. NO. AAD 30465
2. Was this invention made on a Standard Development Order? No
3. Was this invention made for a special job? Yes
4. Will it be used on standard apparatus? Possibly
5. When will it first be built and shipped? Lab Model Completed
6. Give names and dates of printed publications disclosing invention: None

Where necessary, please amplify above answers in space below, and give engineering or commercial bearing on our position in its field or on related apparatus.

PATENT DEPARTMENT
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SIGNATURE OF INVENTOR (S) [redacted]

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DISCLOSURE TO PATENT DEPARTMENT

(WORK/COPY SHEET)

Book No. 5221 PAGE

April 24, 1958 19

IMPORTANT: SIGN, DATE AND HAVE WITNESSED. ATTACH ALL ORIGINAL SKETCHES OR DESCRIPTIONS SIGNED, DATED AND WITNESSED, OR IDENTIFY THE PERMANENT LOCATION THEREOF.

COMPLETE AND ATTACH TRANSMITTAL SHEET

TITLE: RAPID SCAN ANTENNA

This disclosure describes a fast raster scan pencil beam antenna, developed primarily for terrain avoidance application. (Contract # AF33(616)3248). Simple modifications allow this antenna to sector scan a shaped ground mapping beam for bombing and/or reconnaissance application.

Initial system calculations showed that for a maximum information sampling rate over a solid angle of 30° horizontal by 10° vertical a point target beam width time should be approximately three pulses per beamwidth. Originally it was felt that a 1° x 1° pencil beam was necessary for adequate angular resolution. The above information concluded that a raster scanning antenna should scan horizontally approximately 20 per second and vertically 2 cycles per second.

Since conventional mechanical scanning at the above rate has never been accomplished in a practical system, a new approach had to be made.

Prior scanning act includes the following with comments:

1. Mechanical movement of antenna system. This method is not practical due to high accellerations at the end of each horizontal scan. Problems of conical scanning have not been investigated thoroughly but are obviously of the high accelleration nature.
2. Linear array transmitter (vertically scanning a horizontal fan beam) with a vertical beavertail beam linear array which scans horizontally by means of oscillating back wall. The receiver receives information from the position of the intersecting beams. Due to cross polarization and other in efficiencies in the system, the gain is very low. Two antennas also require at least twice the aircraft frontal area as a single antenna. Also a single antenna is much lighter.
3. Ferrite type scanners (not yet developed) show promise in the future if high efficiency can be obtained.

To eliminate high accelerations in the horizontal scan simple motion (preferably rotary) must be accomplished.

The principle of feeding power into parallel plates as described on pages 301-304 of Volume 1 of the Radiation Laboratory Series was used to arrive at my invention.

Basis for an invention lies in the following areas:

1. Method of folding parallel plates for accepting a rotating feed.
2. Rotating feed.
3. Horizontal beam shaping method (2).
4. Application as a bombing and recon antenna.
5. Possible application as a runway approach radar in inclement weather.

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Figure 1 shows the sequency of operations in arriving at the final folded parallel plate configuration. 1-A shows the first configuration that gave good primary feed scanning results. An examination of 1-A shows that curvature A-B whose center is at C cannot be folded into the proper circle without distorting DE and

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April 24, 1958 19 5

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TITLE: RAPID SCAN ANTENNA

likewise distorting the wavefront emerging from DCE.

By folding Figure 1-A approximately along line A-E and substituting the equivalent parallel plate system as shown in figure 1-B, the point of the cone to be fed is in space. The problem of folding is simplified thereby and figure 1-C is the result.

Figure 2 shows a diagram of the rotating feed. In order to obtain a compact rotating elements of high efficiency the rotary joint had to be combined with the feed. This unit is designed to operate in a pressurized compartment thereby eliminating the problem of pressure sealing the rotating joint assembly.

Figure 3 shows a diagram of the horizontal beam shaping method. A phase front passing through the curved bend is delayed more at the center of the bend than at the edges because of the increased path length in that direction thus tending to straighten the phase front, or narrow the emerging beam.

Figure 4 shows an alternate method of beam shaping. The back reflecting wall is curved to both colliminate and control the direction of the beam.

In all cases the vertical beam is sharpened using a parabolic shaped cylindrical reflector. Vertical scanning at 2 cycles per second ± 5 degrees is accomplished by nodding the entire antenna with a hydraulic actuator.

For use as a bombing and reconnaissance antenna. The vertical scanning is not necessary. The cylindrical reflector is shaped for approximately $\csc^2 \cos \theta$ distribution.

A flyable lab model of this antenna has been built and tested with satisfactory results.

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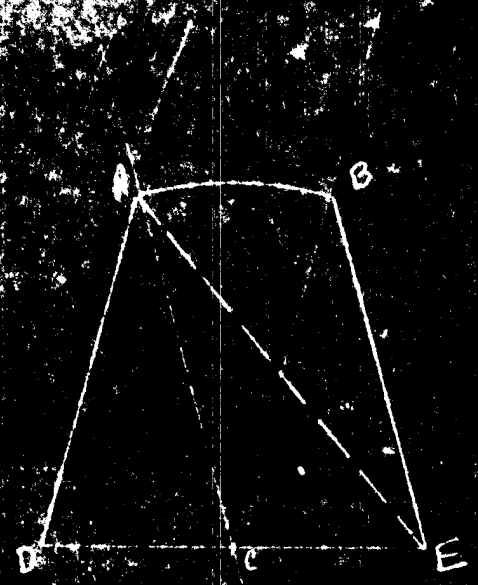

Fig 1-A

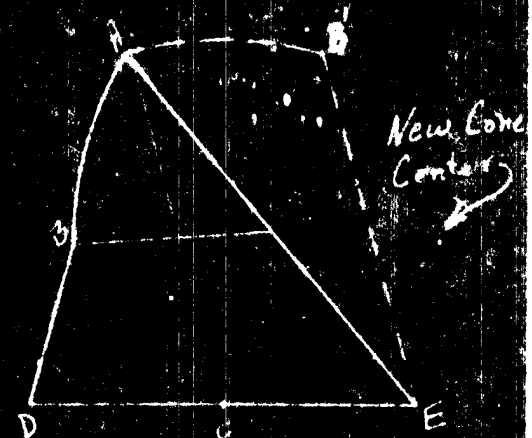

Fig 1-B

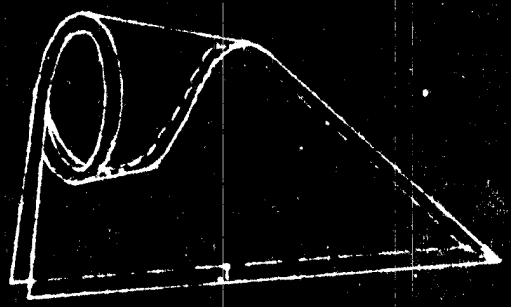

Fig 1-C

Figure 1 Sequence of operations in folding [illegible] Plates

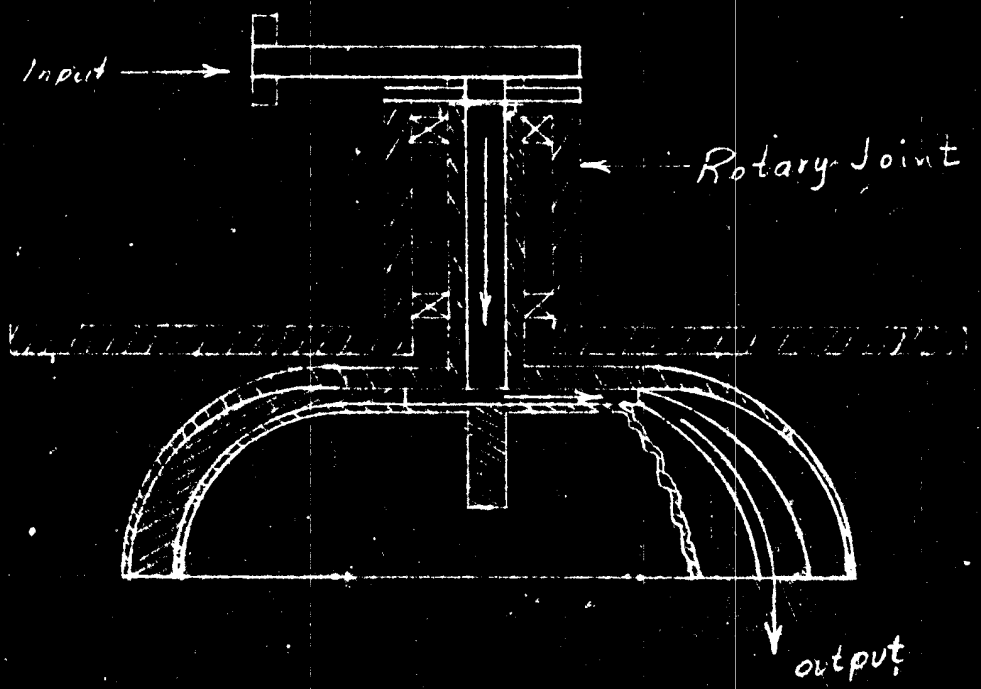

Figure 2. Rotating Feed Construction

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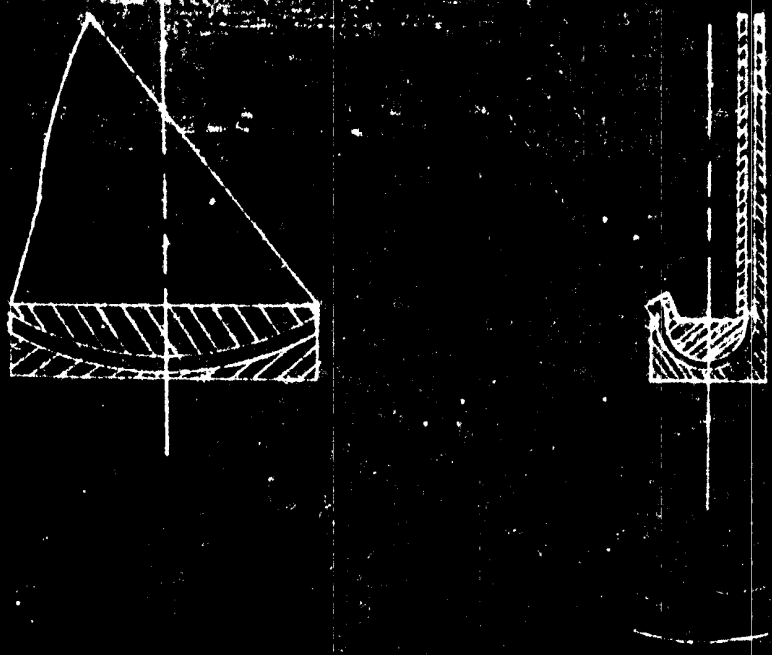

Fig 3 Method of horizontal Beam Shaping showing cross sections of Curved Bend

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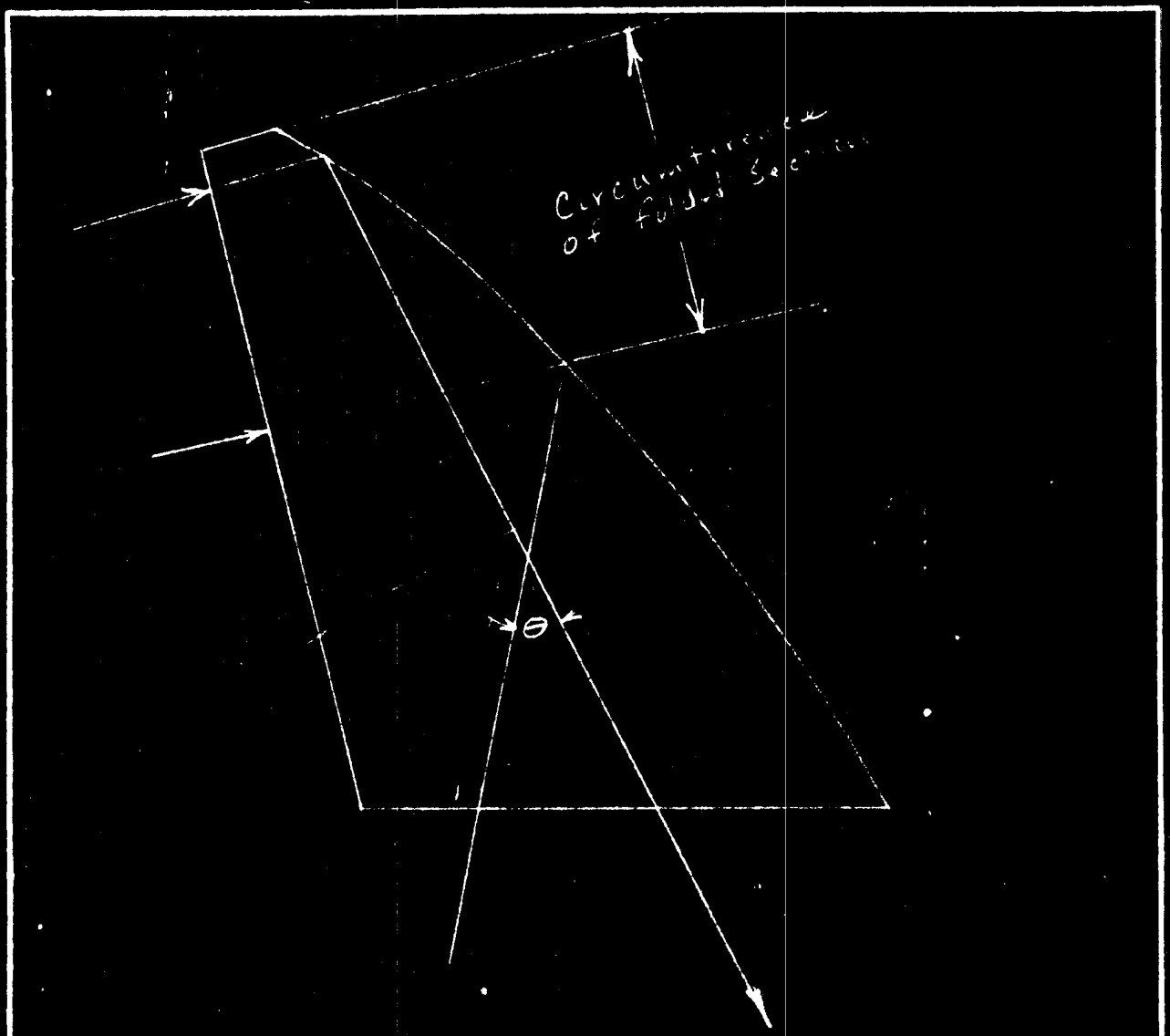

Fig 4 showing Curved Back Wall Beam Shaping Method

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